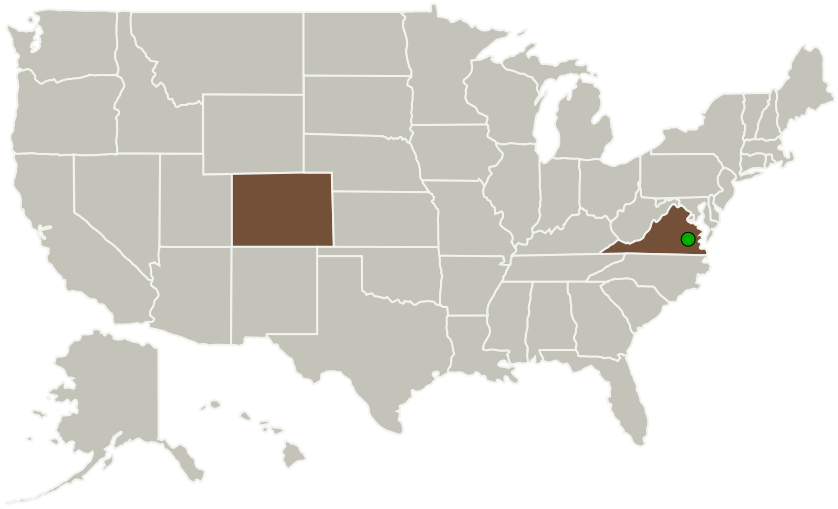
Multifunctional Polyolefin Matrix Composite Structures, Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

Polyethylene, and ultrahigh molecular weight polyethylene (UHMWPE) in particular, is an outstanding material for radiation shielding in the sense that its extraordinarily high hydrogen content both minimizes the production of secondary ions during exposure to energetic radiation and captures neutrons. Its low density and high wear resistance also make it attractive for the structures of manned spacecraft and extraterrestrial habitats. However, its use in structures is limited by its flammability and poor mechanical properties under load compared to other structural materials. While carbon fiber/UHMWPE are an obvious solution, to date they have not proved useful because load is not easily transferred to or from UHMWPE, and because its melt state is too viscous to infiltrate fiber preforms. In this Phase II project, TDA will apply its recent advances in composite manufacturing to create a UHMWPE-matrix composite that has good load transfer to a creep-mitigating continuous fiber reinforcement. Such a composite will not only have outstanding radiation shielding properties, but also have sufficient mechanical properties to be useful as a structural material.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
TDA Research, Inc.	Lead Organization	Industry	Wheat Ridge, Colorado
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Colorado	Virginia

Project Transitions

May 2016: Project Start

May 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139871)*

Images

Briefing Chart Image
Multifunctional Polyolefin Matrix Composite Structures, Phase II *(https://techport.nasa.gov/image/131462)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
TDA Research, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Michael Diener

Co-Investigator:
Michael Diener

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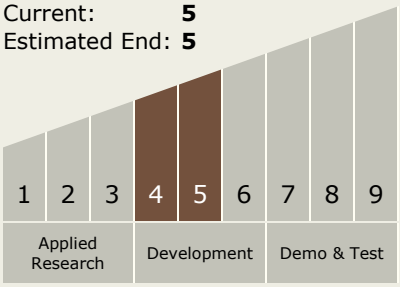
Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.5 Radiation
    - TX06.5.3 Protection Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System